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COMMENCEMENT BAY NEARSHORE/TIDEFLATS
FIVE-YEAR REVIEW REPORT

PREPARED BY

REGION 10

U.S. ENVIRONMENTAL PROTECTION AGENCY

USEPA SF



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FIVE-YEAR REVIEW REPORT COMMENCEMENT BAY NEARSHORE/TIDEFLATS SUPERFUND SITE TACOMA, WASHINGTON

1.0 Introduction

EPA Region 10 has conducted a five-year review of the remedial actions implemented for OU 01 (CB/NT Sediments), and OU 05 (CB/NT Sources) of the Commencement Bay Nearshore/Tideflats (CB/NT) Superfund site located in Tacoma, Washington. This review also provides an overview of investigation and pre remedial design activities for the Hylebos Waterway, Middle Waterway, Thea Foss Waterway and Wheeler-Osgood Waterway problem areas. Other Operable Units of the CB/NT site include ASARCO Tacoma Smelter (OU 02), Tacoma Tar Pits (OU 03), ASARCO Off-Property (OU 04), and ASARCO Sediments (OU 06). These OUs (2, 3, 4, and 6) are treated as separate sites by EPA Region 10 for purposes of five-year reviews.¹

This review was conducted by Ken Marcy, Remedial Project Manager for the Sitcum Waterway and St. Paul Waterway cleanup areas, and the Occidental Chemical removal action on Hylebos Waterway, in December, 1999. This report was reviewed and concurred by Allison Hiltner, CB/NT Team Leader and Remedial Project Manager for the Hylebos Waterway problem areas of the CB/NT site.

The purpose of a five-year review is to determine whether the remedy at a site is (will be) protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and recommendations to address them.

EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA 121(c), as amended, states:

If the President selects a remedial action that results in any hazardous substances,

¹ Contaminated sediments along the Ruston-Pt. Defiance Shoreline were further characterized during a site-specific remedial investigation for the ASARCO Tacoma smelter which was presented as public comment on the CB/NT feasibility study and proposed plan. These investigations confirmed a direct link between the ASARCO facility and sediment contamination. Due to these findings, sediment remedial action for the Ruston-Pt. Defiance Shoreline are not addressed under the CB/NT sediments Record of Decision, and will not be discussed in this Five Year Review.

pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first five-year review for OU 01 and OU 05 of the CB/NT site. The triggering action for this statutory review is the initiation of remedial action at the mouth of the St. Paul Waterway problem area which commenced in 1988. **The focus of the OU 01 review is the remedial activities conducted for St. Paul and Sitcum Waterway problem areas.** Investigation and pre remedial design for other OU 01 problem areas of the CB/NT site, including Hylebos, Thea Foss, Wheeler Osgood, and Middle Waterways, is ongoing (Table 1). Remedial action in these areas of the site has not commenced.

Status of CB/NT OU 01 and OU 05 by Problem Area		
Problem Area	OU 01	OU 05
Sitcum Waterway	Remedial Action Complete (9/23/94)	Source Control Complete (09/94)
St. Paul Waterway	Remedial Action Complete (9/28/90)	Source Control Complete (09/90)
Head of Hylebos Waterway	Pre Remedial Design	Milestone 4 ² Complete
Mouth of Hylebos Waterway	Pre Remedial Design	Milestone 4 Complete
Middle Waterway	Pre Remedial Design	Milestone 4 Complete
Head of City (Thea Foss) Waterway	Pre Remedial Design	Milestone 2 Complete
Mouth of City (Thea Foss) Waterway	Pre Remedial Design	Source Control Complete (06/97)
Wheeler Osgood Waterway	Pre Remedial Design	Milestone 2 Complete

²Source control Milestone Reports are described on page 14.

2.0 Site Location and Description

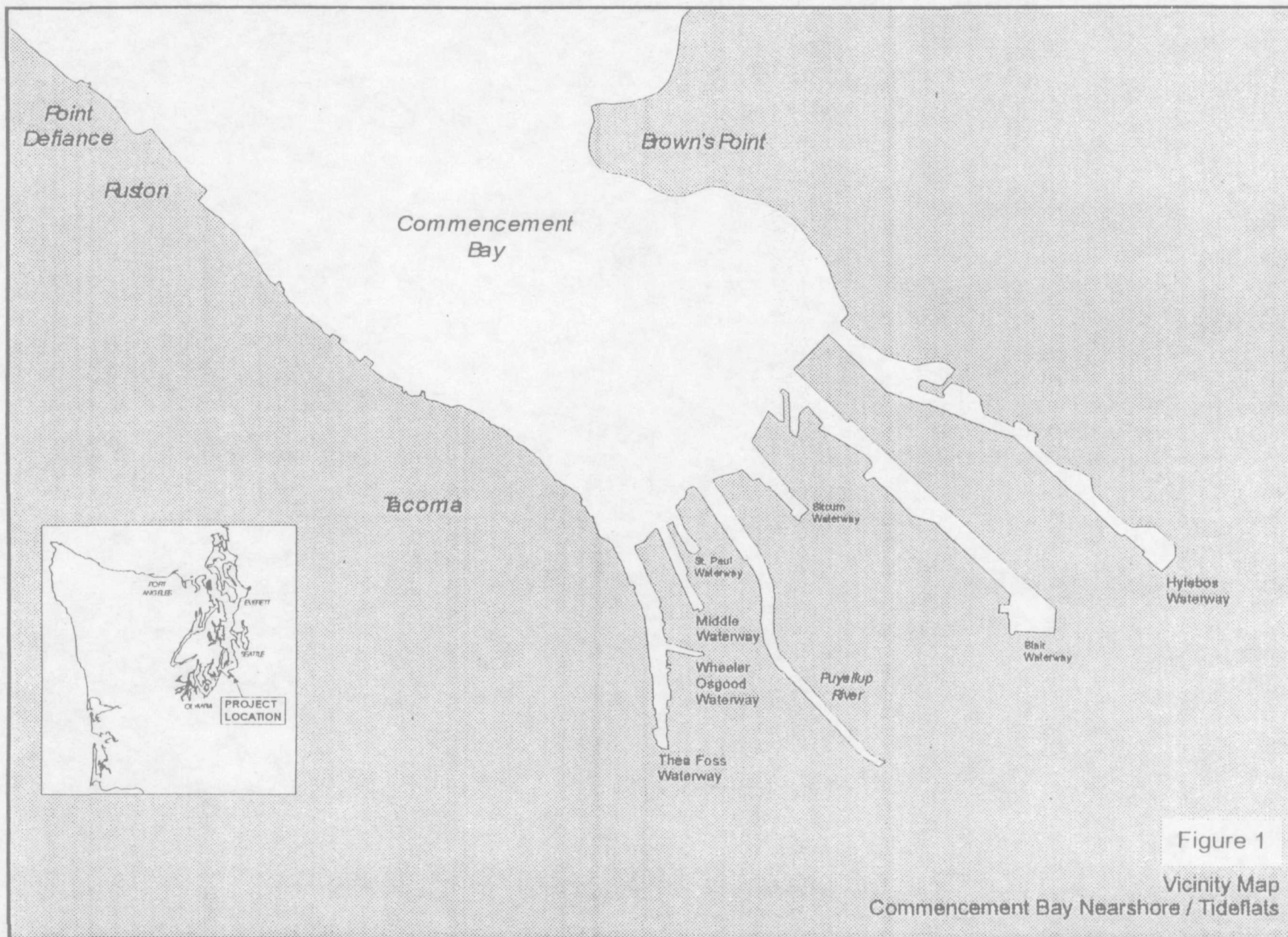
The CB/NT Superfund site is located in Tacoma, Washington at the southern end of the main basin of Puget Sound (Figure 1). The site encompasses an active commercial seaport and includes 10-12 square miles of shallow water, shoreline, and adjacent land, most of which is highly developed and industrialized. The upland boundaries of the site are defined according to the contours of localized drainage basins that flow into the marine waters. The marine boundary of the site is limited to the shoreline, intertidal areas, bottom sediments, and water of depths less than 60 feet below mean lower low water (MLLW). The nearshore portion of the site is defined as the area along the Ruston shoreline from the mouth of the Thea Foss Waterway to Pt. Defiance. The tideflats portion of the site includes the Hylebos, Blair, Sitcum, St. Paul, Middle, Wheeler Osgood, and Thea Foss Waterways; the Puyallup River upstream to the Interstate-5 bridge; and the adjacent land areas.

The CB/NT site is located within the city of Tacoma. The land, water, and shoreline within the site boundary are owned by various parties, including the state of Washington, the Port of Tacoma, the city of Tacoma, Pierce County, the Puyallup Tribe of Indians, and numerous private entities. Much of the publicly owned land is leased to private enterprises. Within the site boundaries, land use is chiefly industrial and commercial.

The Port of Tacoma operates many cargo handling and storage facilities along the waterways and leases other properties to large and small industrial, manufacturing, and commercial tenants. Major private landowners include lumber, chemical, and petroleum companies. Property along the Hylebos Waterway is owned almost exclusively by private companies, and there are several privately-owned parcels along the Blair Waterway. Other privately owned parcels are found predominantly at the landward end of the port and industrial area.

A large portion of the tideland and offshore areas of the CB/NT site is either owned outright by the state or is designated as state-owned harbor areas. The Port of Tacoma owns tidelands and bottom sediments in several areas including the head of Hylebos Waterway, the head of Blair Waterway, and Sitcum Waterway. The St. Paul and Wheeler-Osgood waterways are privately owned. Private ownership of the shorelines and intertidal areas in many portions of the site generally corresponds with ownership of the adjacent upland property parcels.

Contaminants in the CB/NT area originate from both point and nonpoint sources. Earlier industrial surveys conducted by the Tacoma-Pierce County Health Department (TPCHD) and the Port of Tacoma indicated that there are more than 281 active industrial facilities in the CB/NT area. Approximately 34 of these facilities are National Pollutant Discharge Elimination System (NPDES)-permitted dischargers, including numerous storm drains, seeps, and open channels; groundwater seepage; atmospheric deposition; and spills. The TPCHD has identified several hundred nonpoint sources that empty into Commencement Bay.



Commencement Bay, including the CB/NT site, supports important fishery resources. Four salmonid species (chinook, coho, chum, and pink) and steelhead trout occupy the bay for part of their life cycle. Recreational and commercial harvesting of these species occurs in the bay. Extensive inshore marine fish resources include English sole, rock sole, flathead sole, c-o sole, sand sole, starry flounder, and speckled sand dab. rock sole, c-o sole, and several species of rockfish are most abundant along the outer shoreline. Although the TPCHD has warned against regularly consuming fish, shellfish, and crabs caught within the study area, recreational harvesting of many of these species occurs, primarily within the Thea Foss Waterway and along the Ruston-Pt. Defiance Shoreline.

3.0 Site History

At the time of urban and industrial development in the late 1800s, the south end of Commencement Bay was composed largely of tideflats formed by the Puyallup River delta. Dredge and fill activities have significantly altered the estuarine nature of the bay since the 1920s. Intertidal areas were covered and meandering streams and rivers were channelized (Figure 2). Numerous industrial and commercial operations have located in the filled areas of the bay, including shipbuilding, chemical manufacturing, ore smelting, oil refining, food preserving, and transportation facilities.

With industrialization, the release of hazardous substances and waste materials into the environment has resulted in alterations to the chemical quality of waters and sediments in many areas of the bay. Contaminants found in the area include arsenic, lead, zinc, cadmium, copper, mercury, and various organic compounds such as polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs).

3.1 Site Discovery

Commencement Bay was placed on a national interim list of 115 highest priority hazardous waste sites on 23 October 1981. Initially, the Commencement Bay site was divided into four areas: deepwater, nearshore, tideflats/industrial, and south Tacoma channel. The National Priorities List promulgated on September 8, 1983 designated the CB/NT area and the Commencement Bay South Tacoma Channel (CB/STC) as separate national Priorities List sites. The deepwater portion of the bay was eliminated from the list at that time because water quality studies indicated there was minimal contamination in the area.

On 13 April 1983, EPA announced that a cooperative agreement had been reached with Ecology to conduct a remedial investigation/feasibility study on the nature and extent of contamination in the CB/NT site. Under the agreement, Ecology was designated as the lead agency for the investigation. The Commencement Bay Nearshore/Tideflats Remedial Investigation (Tetra Tech 1985), completed in August 1985, characterized the nature and extent

of contamination at the site. The Commencement Bay Nearshore/Tideflats Feasibility Study (Tetra Tech 1988) was completed in December 1988, described feasible alternatives for sediment remedial action at the site. The feasibility study included an integrated action plan (PTI 1988) to coordinate ongoing source control efforts and sediment remedial alternatives, and a sediment quality goals document (PTI 1989) to develop sediment quality objectives. Public comment on the feasibility study was received from 24 February to 24 June 1989. General notice letters were sent by EPA to 133 PRPs on April 24, 1989 informing them of their potential liability for sediment contamination at the CB/NT site.

3.2 RI/FS

The primary objective of the remedial investigation was to define the nature and extent of sediment contamination. That investigation involved the compilation and evaluation of existing data and an extensive field sampling effort to collect additional data. The CB/NT database developed during the remedial investigation consisted of 23 data files, each storing a different kind of data. Data of different kinds were linked together by common identifiers (e.g. survey, station, drainage). At the conclusion of the remedial investigation, the database contained over 25,000 records, each consisting of 15-150 separate variables. There were descriptions of over 50 surveys, 500 sampling stations, and 2,000 samples of water, solids, and biota. Over 400 components of the Commencement Bay drainage system had been identified. Included were data on sediment and water column chemistry, bioassays, benthic invertebrates, fish pathology, and bioaccumulation. The distribution of sediment contaminants is described in detail in the remedial investigation report (Tetra Tech 1985).

There is considerable variation in the types and concentrations of chemical contaminants in CB/NT sediments. Investigations of the nearshore waters of Commencement Bay have demonstrated the existence of sediment contamination by toxic pollutants, accumulation of some of these substances by biota, and possible pollution-associated abnormalities in indigenous biota. The highest concentrations of certain metals (i.e. arsenic, copper, lead and mercury) have been found in sediments in the waterways along the southwest shore, and near the ASARCO smelter. Sediment contamination by persistent organic compounds (e.g. PCBs) was detected in the heavily industrialized waterways (e.g. Hylebos Waterway) and along the Ruston-Pt. Defiance Shoreline.

During the CB/NT remedial investigation, four inorganic and six organic contaminants were detected at concentrations 1,000 times as great as reference conditions (i.e. conditions in sediments from nonindustrialized areas of Puget Sound). Those concentrations were detected in samples from stations located off the Ruston-Pt. Defiance Shoreline, Hylebos Waterway, and St. Paul Waterway. Twenty-eight chemicals or chemical groups had concentrations 100 - 1,000 times as great as reference conditions. Contaminants of concern include metals, PCBs and PAHs.

3.3 CB/NT ROD

In September, 1989, the EPA Regional Administrator approved a ROD for the CB/NT site. The ROD identified the 8 problem areas noted above in Table 1, and set forth the following remedial objectives/major cleanup elements for OU 01 and OU 05:

1. Achievement of acceptable sediment quality in a reasonable timeframe. Acceptable sediment quality is defined by the absence of acute or chronic adverse effects on biological resources or significant health risk, as translated into a set of Sediment Quality Objectives (SQOs).³ The SQOs are defined in discrete, measurable terms relative to specific human health risk assessments and environmental effects tests and associated interpretive guidelines. Acceptable sediment quality may be achieved through the following mechanisms:
 - Natural Recovery: natural recovery may occur through chemical degradation, diffusive losses across the sediment-water interface, and burial and mixing of contaminated surface sediments with recently deposited clean sediments. Natural recovery is considered to be acceptable in all portions of problem areas predicted to reach the SQOs within 10 years.
 - Sediment Remedial Action: remedial action alternatives include in-place capping, dredging/confined aquatic disposal, dredging/nearshore disposal, and dredging/upland disposal.
2. Use of site restrictions consisting mainly of public warnings and educational programs intended to reduce potential exposure to site contamination, particularly ingestion of contaminated seafood.
3. Mitigation of existing sources of contamination to OU 01 through implementation of appropriate site specific source control actions (OU 5). These actions range from preliminary activities that address the most severe site contamination (e.g. site stabilization, expedited response actions) to more comprehensive remedial measures (i.e. remedial design and remedial action). The Washington State Department of Ecology (Ecology) has primary responsibility for implementation of source control activities.
4. Implementation of source and sediment monitoring to determine the success of individual remedial actions and ensuring that all necessary remedial actions have been undertaken in each problem area.

³The SQO for PCBs was subsequently changed in a July, 1997 ESD.

4.0 OU 01, CB/NT Sediments

4.1 St. Paul Waterway

The St. Paul Waterway Problem Area is located between the Puyallup River to the north and the Middle Waterway to the south (Figure 1). A rubble mound jetty was constructed on the west bank of the Puyallup River mouth in the 1930s by the Corps of Engineers as part of the Tacoma Harbor Project. The jetty separates the Puyallup River from the St. Paul Waterway, creating a shallow and calm area of Commencement Bay which ranges in depth from about 20 feet to a sandbar that is exposed at low tide. Natural forces are gradually building up this area by depositing sediment from the Puyallup River. As will be described below, the key areas of sediment contamination were located in this shallow subtidal area. Prior to remedial action, the St. Paul Waterway Problem Area was subtidal.

The St. Paul Waterway itself is about 2,000 feet long, about 500 feet wide, and from about 10 to 30 feet deep. The Waterway was created in stages, beginning in the 1920s. The Waterway area is not used or needed for navigation, other than its historical and current use for log rafts, chip barges, and similar small craft. A 57-acre peninsula of filled tidelands lies between the mouths of the Puyallup river and the St. Paul Waterway. This area was originally an intertidal mudflat between two forks of the mouth of the Puyallup River. The original 1,750 acres of productive mudflat throughout Commencement Bay has been reduced to less than 100 acres in the past century.

The filled uplands and the adjacent tidelands have been used for pulp and paper and related forest products operations since 1927. The Simpson Tacoma Kraft Mill (mill), a pulp and paper facility, is located there. In 1985, Champion acquired the mill as a result of a merger with the St. Regis Corporation. Several months later in August 1985, Simpson acquired the mill from Champion and is the current owner and operator. Although the St. Paul Waterway itself has been privately owned by the mill owners, Simpson and previous owners leased the tidelands in Commencement Bay adjacent to the waterway and mill from DNR, as well as leasing some uplands between the inner and outer harbor lines. DNR manages the leased lands for the State of Washington.

The CB/NT RI identified the St. Paul Waterway Problem Area as a 17-acre area of contaminated marine sediments adjacent to the mill between the mouth of the St. Paul Waterway and the Puyallup River. Simpson and Champion then began detailed studies to review, confirm, and further characterize the St. Paul Waterway Problem Area, in consultation with the agencies, Puyallup Tribe, and the public. The problems stemmed from two sources:

- Wastewater from the plant, which was untreated until the 1960s. This led to contaminated sediments near the mill's outfall. The Superfund studies discovered that several of the key chemicals came from shipments of contaminated products and materials to the plant from

other companies.

- Loss and runoff of woody debris from log and wood chip operations and from stormwater runoff from process areas of the mill.

The sediments next to the mill became contaminated with chemicals and organic debris. In the area near the outfall, chemicals toxic to marine life, such as phenolics (particularly 4-methylphenol), cresols and cymenes, settled into the sediments on the bottom of the Bay. In the same area, and extending into the Waterway, accumulations of logs, wood chips, sawdust, and similar organic debris blanketed the bottom and mixed with the sediments. The data showed three fairly distinct areas of contamination, with lower levels of concern as the distance from the former outfall increased. Area A (Figure 2) closest to the former mill outfall, had the most chemical contamination and less organic woody material. Area B was a mixture of chemical and organic woody material. Area C was largely woodchips on top of the natural sediments. Of the compounds identified in the RI, p-cresol, guaiacol and phenol were found at concentrations exceeding the SQOs in a number of sediment samples taken in the immediate vicinity of the old outfall.

Remedial Action (RA) at the site was designed to provide: 1) permanent isolation from the environment of chemical contamination found in marine sediments, and 2) restoration of intertidal and shallow subtidal habitat. After analyzing the options available for cleanup, capping of contaminated sediments "in place" in the shallow water offshore of the Tacoma Draft Mill was selected as the environmentally preferred alternative. The 17-acre area was capped with clean sediment from the Puyallup River in July and August of 1988. The cleanup action was integrated with natural resource restoration to produce new intertidal and shallow subtidal habitat in Commencement Bay. More than 6 acres of new intertidal habitat were constructed over the portion of the cap along the shoreline. Clean, subtidal habitat was provided over the remaining 11 acres (Figure 3). Construction of the sediment remedial action and related activities such as the outfall, source control, and habitat restoration actions, consisted of nine tasks: dredging for the outfall alignment; placement of outfall dredged material; removal of the former outfall; site preparation; chip barge dredging and placement dredged material with temporary cap; construction of the initial part of the cap; placement of the Sediment cap; fill over the existing outfall area; and habitat enhancement capping. Remedial work was completed and approved by Ecology in September 1988. In January 1991, EPA approved the Commencement Bay Nearshore Tideflats Superfund Completion Report for St. Paul Waterway Sediment Remedial Action.

Physical, chemical, and biological characteristics of the project have been monitored by Simpson consistent with the requirements of the Monitoring Plan for eleven years (1989 - 1999). Bathymetric surveys, conducted annually, have indicated some redistribution of cap material at the site which has not effected the integrity or function of the cap. Chemical monitoring has yielded few detections and biological has shown that abundance and diversity at the site have been similar to background stations indicating a community similar to a typical healthy back-Bay mudflat in Puget Sound. Based on the positive monitoring results received thus far, the Monitoring Plan was revised in November, 1999 to include six additional years of reduced monitoring, and storm-based

monitoring. Storm based monitoring requires that bathymetric and ground surveys of the cap be conducted whenever winds exceed 30 miles-per-hour for more than four hours.

Although the RA was completed in advance of the ROD, EPA accepted the cleanup as meeting the goals and objectives of the ROD. The cleanup achieved SQOs utilizing in-place capping after source control had been achieved. Subsequent monitoring, as described above, has documented the success of the remedy, and has ensured that all necessary actions have been taken.

4.2 Sitcum Waterway

The Sitcum Waterway is located between the Blair Waterway to the northeast and former Milwaukee Waterway, and Milwaukee Habitat Area, to the southwest (Figure 1). It is a deep navigational waterway, created by dredging and filling native mudflats since 1910. The navigational channel is approximately 3000 feet long and 750 wide from bank to bank.

The Port of Tacoma owns the land adjacent to the waterway and the Sediment in the waterway; however, some land near the mouth of the Sitcum is owned by the State of Washington, and managed by the Department of Natural Resources (DNR). The south shore is used as a marine terminal facility by Sea-Land, a Port tenant. Terminal 7 occupies the northeastern waterfront, with facilities for container handling and bulk unloading. Historically, alumina, lead, copper, and zinc ores have been handled at the site. Other properties associated with Sitcum Sediment contamination are connected to the Sitcum Waterway by a large storm drain, called SI-171, that discharges runoff from an industrial and commercial area covering approximately 170 acres into the waterway.

The CB/NT Remedial Investigation (RI) determined that the Sitcum Waterway was contaminated with arsenic, cadmium, copper, lead, nickel, zinc, and polyaromatic hydrocarbons above the SQOs identified in the ROD. In general, the highest concentrations of these compounds were found near the SI-171 storm drain in the southeastern corner, and near Terminal 7 on the northeastern embankment. The ROD estimated that approximately 167,000 cubic yards of Sediment in the Sitcum waterway exceeded SQOs for arsenic and copper.

Prior to EPA's issuance of the CB/NT ROD, the Port had proposed a dredge and fill development project for the Blair Waterway and the Milwaukee Waterway, two waterways within the boundaries of the CB/NT Site, but not identified as sediment problem areas in the ROD. The Port proposed to dredge the Blair Waterway and Sitcum Waterway, with disposal of the dredged material in a nearshore fill in the Milwaukee Waterway. An Explanation of Significant Differences (ESD) (1993), notes the official EPA acceptance of this approach to remedial action for the Sitcum Waterway.

In keeping with the objectives of the 1989 CB/NT ROD described above, and as described in the 1993 ESD, and the EPA-approved Remedial Design (RD), plans for Sitcum Waterway remediation and habitat mitigation incorporated the following remedy components:

- Dredging of approximately 428,000 cubic yards of contaminated sediments from Sitcum Waterway for disposal in the Milwaukee Waterway nearshore fill area. The bulk of this volume, approximately 396,000 yards, was to be removed from the "Phase 1 Area", or Sitcum bottom sediments, the extent of which was limited by rip rap and Pier 7 along the northern shoreline. The "Phase 2 Area", or areas of sediment over existing rip rap and slopes under Pier 7, was to be removed to the extent technically feasible. The ESD estimated approximately 32,300 yards would be removed in the Phase 2 Area. After construction, Phase 2 was to be evaluated for potential future action. In the EPA approved Port memo, dated October 1, 1995, it was determined that no further action would be required in the Phase 2 Area, and that the area beneath Pier 7 would continue to be evaluated for natural recovery as specified in the Operation Maintenance and Monitoring Plan. The area beneath Pier 7 is now known as Area B, while the original Phase 1 Area is now known as Area A.
- Dredging of approximately 2.1 million cubic yards of sediment from the Blair Waterway for construction of, and disposal in, the Milwaukee Waterway nearshore fill area. Of the 2.1 million cubic yards, 1,225,400 cubic yards were designated as "clean" and targeted for construction of the Milwaukee Waterway nearshore fill berm. The remainder of the Blair sediments were targeted for disposal in the Milwaukee nearshore fill area.
- Construction of a nearshore fill area utilizing approximately 72% of the Milwaukee Waterway.
- Construction of habitat mitigation at two locations: 1) the Milwaukee Habitat Area located in front of the nearshore fill closure berm in the mouth of the Milwaukee Waterway, consisting of approximately 20 acres of intertidal habitat; and 2) an "additional mitigation area" consisting of approximately 9.5 acres of restored, off-site, refuge habitat for salmon and other fish from the Puyallup River. The area constructed, known as "Clear Creek", is located near the mouth of Clear Creek, a left bank tributary of the Puyallup River near River Mile 2.9.

EPA conducted a pre-final inspection of Sitcum and Blair dredging, and Milwaukee nearshore fill construction on December 14, 1994. EPA determined that RA activities had been completed by all parties according to ROD, ESD and RD specifications. Dredging and fill volumes were slightly adjusted during construction. Outstanding activities noted during the inspection included: 1) complete demobilization, 2) removal of weir at Clear Creek, and 3) final grading of the Milwaukee nearshore fill cap. All of these activities have been completed and documented in subsequent memoranda. EPA formally approved construction completion on July 25, 1995 (EPA response letter to construction completion reports).

Sediment monitoring in Sitcum Waterway, and groundwater monitoring in and around the Milwaukee nearshore fill conducted by the Port of Tacoma since construction completion continue to confirm the efficacy of the original remedy. Area B 1998 monitoring has indicated that natural recovery is taking place more rapidly than expected with only a few stations showing slight exceedances of SQOs. Area A monitoring continues to indicate that concentrations of target chemicals remain well below SQOs.

The October, 1998 monitoring report noted exceedances of SQOs for mercury in the head of the waterway. Mercury was not detected above SQOs either prior to, or immediately after cleanup. The presence of mercury indicates the possibility of a new source of contamination to the waterway. Potential sources and response actions are currently being evaluated by EPA. The presence of mercury, however, is not an indication of the failure or inefficacy of the original remedy.

EPA conducted a pre-final inspection of the Milwaukee Habitat Area construction on June 20, 1995. Based upon the inspection and subsequent response to EPA concerns, EPA determined that construction activities had been completed by all parties according to ROD, ESD, and RD specifications. Issues identified during the pre-final inspection included: 1) missing upland plant species, 2) damage to saltmarsh plants due to goose browsing/grazing, and 3) potential erosion. All issues were addressed in a June 22, 1995 memo to EPA from the Port and completion of site construction activities was approved by EPA on July 25, 1995 (EPA response letter to project completion reports). Monitoring of the habitat area has proceeded according to the OMMP. Thus far the habitat area performance has been satisfactory.

EPA conducted a pre final inspection of the Clear Creek Habitat Area on November 3, 1998. EPA determined that construction activities had been completed by all parties according to ROD, ESD, RD and OMMP specifications. No issues were identified during the pre-final inspection and EPA approved the December 17, 1998 Construction Completion Report. Monitoring of the habitat area per the OMMP commenced in 1999. The first data reports have not yet been submitted to EPA for review.

4.3 Thea Foss and Wheeler-Osgood Waterways

The Thea Foss (formerly City) Waterway has approximately 3 miles of shoreline. Numerous types of industries have operated along both the Thea Foss and Wheeler Osgood Waterways since the early 1900's. The Wheeler Osgood Waterway is one of the smaller waterways of Commencement Bay and is appended to the Thea Foss Waterway, lying in a southeasterly direction.

The west shore of the Thea Foss Waterway is largely owned by the City of Tacoma through the Metropolitan Parks District. The east shore is owned by numerous companies. Past operations on the Waterways include maritime industries, foundries, electroplating, woodworking, and plywood factories, as well as oil companies, and a coal gasification/electricity plant. The waterways are also

impacted by significant stormwater flows from storm drains that drain over 5,000 acres of upland commercial and residential land. Over the years, these operations have led to the contamination of bottom sediments which are harmful to marine life in Commencement Bay.

Contaminants found at levels exceeding the SQOs in the Thea Foss and Wheeler Osgood Waterways include zinc, lead, mercury, high molecular weight polycyclic aromatic hydrocarbons (HPAHS), low molecular weight polycyclic aromatic hydrocarbons (LPAHs), cadmium, nickel, and copper. In addition, non-aqueous phase liquid (NAPL) seeps have been found at the head of the Thea Foss Waterway.

In March of 1994, EPA entered into an Administrative Order on Consent (AOC) with the City of Tacoma to conduct pre-remedial design work to enable EPA to select a remediation plan specific to the Thea Foss (head and mouth) and Wheeler-Osgood Waterways consistent with the ROD. The AOC called for the City to complete various pre-remedial studies and a remedial design for the cleanup of the waterways. The City has completed all of the pre-remedial studies, including three rounds of in-water data collection. The Round 3 Data Evaluation and Pre-Design Evaluation Report were submitted to EPA in the fall of 1999.

EPA issued a proposed cleanup plan for the Thea Foss and Wheeler Osgood Waterways in November, 1999 which included dredging of 646,000 cubic yards of contaminated sediments, capping 33 acres, and monitoring 25 acres of marginally contaminated sediments as natural recovery areas. At the end of the public comment period, EPA will finalize the cleanup plans and initiate Consent Decree negotiations with PRPs in spring of 2000 for design and cleanup. EPA hopes to initiate the cleanup by winter of 2001.

4.4 Middle Waterway

Middle Waterway, located between the Thea Foss and St. Paul waterways, is the smallest of the Commencement Bay waterways with remaining problem sediments, and the last to undergo pre-remedial design studies. Middle Waterway is roughly 3,500 feet long and 300 feet wide. Approximately two-thirds of the waterway is undisturbed mudflat, and because of the importance of this habitat type, habitat restoration sites are planned or have been completed in two areas at the waterway head. Current shoreline uses include an operating ship repair yard, a marine painting operation, and several light industrial and commercial operations. Sediment contaminants such as mercury, copper, and polynuclear aromatic hydrocarbons are largely related to past sources such as boat and ship repair yards, metal foundries, machine shops, and wood industries.

EPA and the Middle Waterway Action Committee (MWAC), which is comprised of Foss Maritime Co., Marine Industries Northwest, Inc., and Pioneer Industries, Inc., entered into an Administrative Order on Consent (AOC) for preparation of pre-remedial and remedial design studies for Middle Waterway in April 1997. Under the AOC, MWAC has completed two rounds of sampling to characterize the nature and extent of contamination. The second round of sampling was completed

in October 1999. These data will provide the information necessary to further refine Sediment remedial areas and volumes.

As currently scheduled, MWAC will submit a draft data evaluation report, draft evaluation of remedial options, and draft remediation plan to EPA in June 2000. EPA anticipates that the final design will be submitted in the winter of 2001. MWAC currently estimates that 75,000 cubic yards of contaminated sediments may require removal. EPA expects that the disposal of Middle Waterway contaminated sediments will be combined with sediments from the Thea Foss or Hylebos waterways.

4.5 Hylebos Waterway

The Hylebos Waterway is the northernmost waterway in the Commencement Bay tideflats area. The three mile long waterway has been the site of several industries, such as manufacture of chlorine and chlorinated chemicals, ship building and repair, scrap metal recycling, and log export, since the early 1900's. Sampling during the 1984 RI showed several contaminants of concern in Hylebos Waterway sediments, including arsenic, PAHs, hexachlorobenzene, and hexachlorobutadiene.

EPA and a group of Hylebos Waterway PRPs known as the Hylebos Cleanup Committee (HCC), which consists of ASARCO, Inc., Elf Atochem North America, Inc., General Metals of Tacoma, Inc., Kaiser Aluminum and Chemical Corporation, Occidental Chemical Corporation, and the Port of Tacoma, signed an Administrative Order on Consent (AOC) for pre-design studies in 1993. Under the AOC, the HCC has collected more than 500 physical, chemical, and biological samples in two sampling rounds to characterize the nature and extent of sediment contamination. The HCC developed a cleanup plan to address contaminated sediments, evaluated the success of source control, and inventoried and evaluated potential disposal sites for dredged contaminated sediments.

EPA issued a proposed cleanup plan for the Hylebos Waterway in November, 1999 which included dredging of 940,000 cy of contaminated sediments, capping 11 acres, and monitoring 20 acres of marginally contaminated sediments as natural recovery areas. At the end of the public comment period, EPA will finalize the cleanup plans and initiate Consent Decree negotiations with PRPs in 2000 for design and cleanup. EPA hopes to initiate the cleanup by the end of 2001.

During the course of the pre-design studies, it was determined that two areas of the Hylebos Waterway should be addressed separately because the materials present are different than the rest of the waterway sediments. In one area, a group of wood products companies (known as the "Wood Debris Group") are working under an AOC with Ecology to investigate the extent of wood debris in the turning basin at the head of Hylebos Waterway. They are also evaluating options for remediation of wood debris. Ecology plans to issue a proposed Cleanup Action Plan for public comment in early 2000.

In the second area, Occidental Chemical Corporation is working with EPA under a separate AOC for a Removal Action to investigate the extent of and cleanup options for sludge-like material and a contaminated intertidal area at the Mouth of the Hylebos Waterway. The sludge-like material may require treatment before disposal, and plans are underway to pilot test some of the treatment options. EPA will issue a draft Engineering Evaluation/Cost Analysis to implement the removal action in January, 2000.

5.0 OU 05, CB/NT SOURCES

The ROD recognized that the sources of contamination throughout the CB/NT Superfund site would have to be controlled before sediment cleanup could be achieved. The cleanup strategy for CB/NT has been to eliminate or reduce on-going sources to the extent practicable before implementing in-water cleanup actions. While Superfund is an effective tool to clean up existing contamination, other authorities are needed to address on-going releases. Several federal, state and local programs were identified as tools to address source control independently of Superfund. In 1989, EPA and Ecology entered into an agreement that identified the Ecology Commencement Bay Urban Action Team (UBAT) as lead for implementing source control actions. Ecology uses many regulatory tools to control sources, including the Model Toxics Control Act (MTCA) to address upland and groundwater sources and pollutant discharge permits under the Clean Water Act to address direct discharges to the waterways. Ecology reports its progress on the control of sources to EPA and consults with EPA on whether source control is sufficient to move forward with in-water cleanup actions. The administrative mechanism used by Ecology to inform EPA of its progress on source control is a series of reports called Milestone Reports issued for each problem area identified in the ROD. There are five types of Milestone Reports and their purpose is as follows:

- Milestone 1 - On-going Confirmed Sources Identified. Ecology has investigated and evaluated all potential sources, and identified all on-going, confirmed sources of problem chemicals.
- Milestone 2 - Essential Administrative Actions in Place for Major Sources. Ecology has issued administrative actions, such as orders, consent decrees, or permits, to address sources of problem chemicals in each problem area to ensure that they will be controlled to the extent necessary to prevent sediment recontamination. Major sources are those most directly linked with current sediment impacts.
- Milestone 3 - Essential Remedial Action Implemented for Major Sources. Ecology has implemented all the remedial actions, such as upland soil cleanup, adoption of best management practices, storm drain cleaning, etc., for all major sources. Essential remedial actions are those needed to eliminate or reduce those contaminant sources that are most likely to recontaminate sediments.
- Milestone 4 - Administrative Actions in Place for All Confirmed Sources. Ecology has implemented all of the administrative actions discussed under Milestone 2 for all confirmed sources.
- Milestone 5 - Remedial Action Implemented for All Sources. All essential source control

work under the decrees, orders, or permits has been completed.

Completion of Milestone 5 fulfills the Remedial Action requirements of OU5 as described in the ROD. To date, Ecology has completed the following Milestone Reports for the problem areas identified in the ROD:

- Mouth of Thea Foss: Milestones 1 through 5
- Head of Thea Foss: Milestones 1 and 2
- Wheeler Osgood: Milestones 1 and 2
- Mouth of Hylebos: Milestones 1 through 4
- Head of Hylebos: Milestones 1 through 4
- Middle: Milestones 1 through 4
- Sitcum: Milestones 1 through 5
- St. Paul: Source Control Completion Report (October, 1990)

EPA expects that all Milestone Reports will be submitted and approved by the end of 2000.

5.1 St. Paul Waterway

Initial source control measures began in August of 1985 when Ecology took action to reduce source loading of problem chemicals to the St. Paul Waterway at the Tacoma Kraft Mill (Simpson). From 1985 to 1990, approximately 30 additional individual source control actions were undertaken jointly by responsible parties and regulatory agencies. Source control actions included relocation of the Simpson outfall, process modifications, effluent discharge limits, and stormwater controls. In September 1990, EPA approved Ecology's Source Control Completion Report for the St. Paul Waterway.

5.2 Sitcum Waterway

The major sources most directly linked with sediment impacts in Sitcum Waterway were the Port of Tacoma Terminal 7 ore off-loading facility and the City of Tacoma Storm Drain SI-172. These major sources have been addressed with state administrative actions, including cessation of black ore off-loading at Terminal 7 and removal of sediment from Storm Drain SI-172. The completion of this work concluded an important step in source control action and in implementing the remedial action for the Sitcum Waterway. In September, 1994, EPA approved Ecology's Source Control Completion Report for Sitcum Waterway, noting fulfillment of Milestones 1 through 5.

5.3 Thea Foss and Wheeler Osgood-Waterways

Ecology has identified numerous ongoing sources in the Thea Foss and Wheeler-Osgood Waterways and has taken cleanup action. In addition to Ecology's efforts to control independent sources, the City of Tacoma has been actively involved in controlling municipal source by implementing the Stormwater Management Program. The program lays out a step-wise, on-going process for characterization of effluent, identification and prioritization of potential chemical sources, actions to address sources, and monitoring and reporting on results. Under this program, the City has conducted hundreds of inspections, required businesses to implement best management practices, and required cleaning of stormwater drains, lines and catch basins. These actions, coupled with Ecology's efforts, have eliminated or reduced numerous significant sources of contamination to the waterway. Milestone 5 and source control completion have been achieved for the Mouth of Thea Foss.

At the head of the Thea Foss Waterway, municipal stormwater discharges and highly contaminated subsurface NAPL, both in the waterway and adjacent uplands, pose a risk of recontamination of surface sediments above SQOs or above adverse biological effect levels. If further source control actions are not taken, BEP and polycyclic aromatic hydrocarbons (PAHs) are predicted to recontaminate sediments in some segments of the waterway after sediment cleanup.

Ecology is working with various parties to complete remedial and administrative actions in upland areas around the head of the Thea Foss Waterway to conduct source control and source removal. These actions are being or will be implemented in the upland areas by Ecology under the MTCA.

5.4 Middle Waterway

Ecology identified several ongoing source to Middle Waterway sediment contamination. Essential source control actions have been completed for all of these facilities, as documented in Ecology's milestones reports for Middle Waterway. Essential administrative actions are in place to address all of these sources of contaminants to Middle Waterway sediments, as documented in Ecology's October 1997 Milestone 4 report for Middle Waterway. Completion of Milestone 5 source control activities for Middle Waterway will likely take place after Remedial Design sampling and evaluation.

5.5 Hylebos Waterway

Ecology identified 10 major ongoing source to Hylebos Waterway sediment contamination. Essential source control actions have been completed for all of these facilities, as documented in Ecology's milestones reports for the Mouth and head of Hylebos Waterway. In addition, Ecology identified 19 other sources of contamination to Hylebos Waterway sediments. Essential

administrative actions are in place to address all of these sources of problem chemicals to Hylebos Waterway sediments, as documented in Ecology's November 1999 Milestone 4 reports for the Mouth and Head of Hylebos Waterway. Ecology has completed source control actions for 16 of these sources and plans to complete all Hylebos source control work by the summer of 2000.

6.0 RECOMMENDATIONS AND CONCLUSIONS

As indicated above, remedies for both the Sitcum and St. Paul Waterway Problem Areas have proven to be effective. Ten years of long term monitoring for the St. Paul cap and habitat area, including physical, chemical and biological monitoring, have shown the cap to be functioning well at isolating contaminants and there has been no indication of recontamination. EPA recently approved the post 10-year monitoring plan which requires that regular bathymetry and transect surveys be conducted over the next six years to ensure that the cap remains physically intact. Storm events will also trigger physical monitoring.


Removal of contaminated sediments from Sitcum Waterway, construction of the Milwaukee Waterway nearshore fill, construction of the Milwaukee Habitat Area, and construction of the Clear Creek Habitat Area, have also proven to be effective. Monitoring since the RA has shown that contaminated sediments targeted for removal were removed effectively and that natural attenuation in remaining areas is proceeding more quickly than originally anticipated. Continued monitoring of the Milwaukee nearshore fill has demonstrated that the fill is functioning as designed, and that contaminant leaching has not been observed. The Milwaukee Habitat Area appears to be functioning satisfactorily and construction of the Clear Creek Habitat Area was completed according to design specifications. Monitoring of these areas will continue to ensure adequate function and protectiveness of the remedy.

Recently observed mercury concentrations at the head of the Sitcum Waterway that exceed SQOs do not appear to be the result of the remedy implemented in 1994. Prior to, and immediately after RA, mercury was not detected above the SQO in the waterway. Observed concentrations, then, have been contributed by a recent source. The Port of Tacoma, with EPA oversight, is currently evaluating potential upland sources, and will work to address both the possibility of a repeat release, and the mercury contaminated sediments currently in the waterway.

OU 05 source control activities have been completed for Sitcum Waterway, St. Paul Waterway, and the Mouth of Thea Foss. Remaining source control for the Thea Foss Waterway, Wheeler-Osgood Waterway, Middle Waterway, and Hylebos Waterway are expected to be completed by the end of 2000.

In conclusion, the remedial actions initiated for OU 01, and OU 05 of the Sitcum and St. Paul Waterway Problem Areas of the CB/NT site have been successfully completed, and the remedies implemented remain protective of human health and the environment. Remedial action activities for the remaining CB/NT problem areas - Hylebos, Thea Foss, Wheeler-Osgood, and Middle Waterways - have yet to be initiated. RA for all problem areas will be evaluated in a subsequent five-year review in 2004.

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Date


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